

1958

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85th Cong 1958

A Challenge to the American Education System

Mr. President, the second session of the 85th Congress is confronted with some of the most difficult and momentous problems in the history of this Nation. They are problems and issues which will affect the stature and future of the United States, both at home and abroad.

I speak of Civil Rights, the Missile and Defense Program, Foreign Aid, Reciprocal Trade, a new Farm Program and a program to strengthen and regain our technological and scientific supremacy. It is the latter of which I would like to speak today.

Several months ago we found ourselves second to the Soviet Union in the race for technological supremacy in the field of missiles and rockets. The Russians have put two satellites into outerspace; they have announced that they have put the first atomic powered ocean vessel into operation, and are boasting of greater things to come in satellites. And in spite of the fact that our missile and rocket programs have been speeded up to a crash basis the United States has not yet fired its first small satellite into outerspace. All

in all it has been a serious blow to our security and prestige throughout the world.

Why did it happen and most important of all how can we regain our superiority?

There are a number of reasons why we find ourselves in this spot but that is not the issue I am concerned with today. Today my only concern is how can we prevent the reoccurrence of this situation. One solution is through a sound and thorough program for training increased numbers of scientists, technicians and engineers and seeing that their talents are being put to use. We must place a renewed emphasis on basic research. Basic research is the root of all of the great advancements being made in science; humanitarian and military.

The most important consideration in the Soviet Union's ability to surpass us in certain areas of science and technology is the Russian educational system. I want to make it perfectly clear at this point that we as a free Nation should not adopt a dictatorial method as is done in Russia.

But their recent achievements have underscored the need for a review of our educational system. We need a renewed emphasis on science in our classrooms but this should not be done at the expense of other areas in our education. However, the Soviet Union's substantial lead in numbers of scientists and engineers must not be allowed to continue.

The young Russian student is given practically no chance to select his own courses. They are chosen for him. In this country our students have a wide choice, limited only by the facilities and staff of each school. All that is required is that they meet basic requirements. Too often experience shows that American students take the easy way out. We cannot force our students to take science and engineering courses but we should provide incentives that would spark their interest. This requires new teaching methods, new and improved facilities, more adequately trained instructors in our schools, financial aid at the college level in this age of ever-increasing costs and a future of greater stability and respect for those in the scientific fields.

By the time a student in Russia has finished his 10th regular school term, he has had 4 years of chemistry, 5 years of physics, 5 years of biology, and 10 years of mathematics.

Soviet students get little chance to examine important problems with a critical eye, or to make up their own minds on issues that may arise.

Although this is a major fallacy in the Russian educational system it has produced an abundance of capable scientists and engineers who in turn have made it possible for the Russians to make such tremendous advances in missiles and rockets.

Allen Dulles, Director of the CIA, estimated some time ago that during the ten-year period, 1950 - 60, the Soviets would graduate 1,200,000 in the sciences, while the United States would graduate 900,000. There may not appear to be such a great difference on the surface but it is vitally important to remember that the vast majority of the Russian scientists are being utilized for research and defense efforts directed by the Soviet Government. In the United States our scientists, engineers and technicians

go into private industry, devoting many of their talents to peacetime and semi-luxury purposes, some are working for our defense effort and others are completely lost in areas where their capabilities are not being used.

In Russia the scientists enjoy a great deal of respect in society. In this country they do not universally enjoy such a position.

According to information compiled in a report released in March of 1956 by the Joint Committee on Atomic Energy, the American secondary-school system, as of 1936, was characterized as yielding to no other in the broadness of its democratic pattern and our methods of teaching science on the secondary-school level were more original, varied and skillful than those in vogue in either France or Russia at that time.

Today the American school system enrolls more than 90 percent of the children from 7 to 16 years of age - a figure exceeding that attained in any other country. However, during the years since 1936 the teaching of the physical sciences in the American secondary schools has suffered a steady decline. Physics and chemistry are now frequently elective 1-year

laboratory courses and stress is laid on physical rather than on mathematical thinking. Whether as a corollary or as a cause, the teaching of mathematics at the secondary school level has also declined. To meet this situation many colleges have adjusted their science courses to meet the high school offerings.

Where does the responsibility rest for this lag in our scientific and engineering program? There is no one person or organization that can be blamed. It is a combination of things. There is inadequate training and discipline in high schools. Most of our colleges have failed to expand the use of their facilities and to encourage students to complete their courses. Deficiencies in our military draft policies as they affect our college students are an important consideration, for many talented students are placed into routine positions in the armed services where their talents are not utilized.

I think most everyone will agree that ever since the end of World War II the American Way of Life has required less raw manpower and the demand for technicians, engineers and scientists has been swiftly increasing.

Unfortunately our production of these people in these fields has not met the change.

Prior to the Korean War we had an over abundance of scientists and engineers. But the Korean conflict and the boom in electronics, nuclear energy and guided missiles transformed the picture. The industrial ratio of engineers to factory worker, which stood at one to 250 in 1900, increased to one to 60 in 1950 and is rising with every new automation process. In some industries today the ratio is as high as one engineer for every ten employees.

As never before in our history this nation's security rests in the hands of its scientists and engineers in the technological front lines of scientific progress. Nuclear and thermonuclear weapons, intercontinental guided missiles, supersonic jet planes, radar warning nets, these are the complex instruments upon which depends our ability to preserve peace and to resist aggression if it should come. To develop these instruments and weapons and to improve them we need men and women of the highest caliber

in both theoretical and applied mathematics, physics, chemistry and related fields. Basic research is vital to all progress made in these scientific fields.

The United States requires 30,000 to 35,000 new engineers annually; the new production burdens of the cold war require another 3,000 to 4,000 a year. But in 1954 accredited U.S. schools graduated only 22,000 engineers. At the same time, the Soviet Union graduated more than 53,000. In addition, Russia is graduating far more men in the sub-professional fields of engineering, in the "technical areas that are so vital in a technological age." The Russians who produced only about 9,500 engineers in 1928 are now graduating engineers at a rate 2-1/2 times greater than the United States.

In the past several years warnings have been sounded by prominent scientists, educators and statesmen both here and abroad. Despite the numerous speeches, statements and magazine articles which have painted such a dismal picture, very little has been done to remedy the situation. It took the Russian sputniks to really arouse Americans to this challenge. We

must plan now for the present and the future in regaining our complete mastery of the sciences.

I have expressed my views on the shortage of scientists and engineers here in the Senate on several occasions. I have been concerned about this shortage for sometime and it is one of the gravest problems that now faces the Congress.

On June 22, 1956 I addressed the Senate on this issue and recommended a six-point program to meet the shortage of scientists and engineers. I am today restating these six points, because I feel that they would go far in improving the situation.

1. An expanded Federal scholarship program for college and graduate students in the natural sciences and engineering. In order to insure an adequate number of trained personnel in the service of the Federal Government in highly technical and skilled fields I suggest that the Government, under a scholarship program, select a number of high school students each year who have shown special scientific interests and capabilities and underwrite their education. In return these students could be required to put in a period of service after graduation which would be in some way beneficial to our

national security, in the military or industry.

2. Re-emphasis on science and mathematics instruction in the high schools of the nation. This must be a cooperative move between the local school districts and the states' Departments of Education.

3. Increased salaries for high school and college instructors.

4. A Federal grant-in-aid program to the states for science and mathematics teachers in the high school somewhat similar to existing Federal aid for certain agricultural and vocational training in the secondary schools.

5. A revised Selective Service program, making allowances for students and graduates pursuing a career in the sciences and engineering.

6. An improved public relations and security program for scientists, engineers and technical personnel.

7. This is an additional point. Increased salaries for scientists and technicians in the employ of the Federal Government so that the temptation to go out into private enterprise will be lessened. This has been partially met by the recent salary increases for scientists as announced by the Civil Service Commission.

This is a cooperative program. We need the help of the States, local and county school officials and the general public. But the Federal government must take the lead in meeting the crisis, nothing else will do. Only the Federal Government has the resources and prestige to produce the new

emphasis that is needed on the training of qualified young people in the engineering and scientific fields.

In order to keep ahead in the world-wide race of technological advancement, the United States will need a vast and continuing supply of first rate scientists and engineers. The proposals that I have made will, in my estimation, help to regain American stability and supremacy in the sciences, which will be so necessary in the years to come.

There are a number of things that this legislative body can do.

We can expand and appropriate sufficient funds for the summer training program for high school science and mathematics teachers under the direction of the National Science Foundation.

We can revise our Selective Service laws so that consideration is given to those talented in the sciences and engineering. Military service should be secondary to the completion of college work in these instances.

While in the Armed Services their talents should be put to good use.

We can amend our Income Tax laws giving parents an additional exemption

while sending their children to schools of higher education. This would be of great help in this age of ever-increasing tuition and living costs.

We can enact Federal aid legislation which would help high schools and colleges improve and add additional laboratory facilities in their science departments.

Finally, we can and must enact a broad graduate and undergraduate scholarship program in the sciences and engineering. An expanded Federal scholarship program would do much to increase our supply of these professionals.

At the present time the Federal Government's role in promoting the education of potential scientists and engineers is generally limited to the National Science Foundation.

The Foundation's fellowship system is the most direct means of augmenting the Nation's scientific manpower resources. By awarding fellowships for pre-doctoral study also, the Foundation offers to an average of 600 selected students a year the opportunity to undertake at institutions of their choosing, the advanced training necessary for a career in research.

The Foundation has a fine record but its role in the scholarship field is limited. The number of scholarships should be increased and funds should not be limited to pre-doctoral and graduate work. Direct assistance to students studying in the sciences and mathematics below the graduate level is necessary in order to increase the number of adequately trained scientists and engineers.

A nation-wide testing program in our high schools at the Sophomore level would be an important start in seeking out the potential student applicants for scholarships to study science and engineering in college. The States' Departments of Education could play an important part in this phase of the program.

I have sent to the desk legislation which would amend Public Law #507 giving the National Science Foundation an expanded role in granting scholarships for study in the sciences. This independent agency is in the best position to put such a program into operation. It is already in operation and

my proposal would expand its activities and make available sufficient funds for such a scholarship program. Funds would be made available on an annual basis and could be adjusted to the needs of the Nation.

This is one of a number of proposals which will be submitted to Congress this session. There are those who advocate the appropriation of funds under the Health, Education and Welfare Department for an elaborate scholarship program. There are those who suggest the formation of a National Science Academy along the line of our military academies. And there are those who would prefer a much more limited program of assistance. This is one of the greatest issues before Congress this session and it is imperative that something be done soon to turn back the tide of Russian supremacy in numbers of scientists and engineers.

A scholarship program of grants will be branded by some as a "subsidy". But we should not let this deter us, we subsidize our merchant marine and our airlines for defense purposes and we subsidize our farmers. Why then, shouldn't we subsidize the education of our talented youngsters.

It, too, would be in the interest of our country.

The entrance of the Federal Government into the area of aid to education is not without precedent.. There has been a Federal-State cooperative program of vocational education since 1917 and it has proved to be highly successful. The Smith-Hughes Act provides for cooperation between the Federal Government and the States in the promotion of vocational education of less than college grade.

Federal funds are available for allotment to the States for agricultural education, distributive education, home economics education, and trade and industrial education. Federal funds are used to stimulate and assist the States in making adequate provisions for such training.

In 1946 the George-Barden Act was enacted to further develop the vocational education program.

~~is, and should be, in the interest of our country.~~

The Government cannot legislate scientists into being and we cannot conscript students. We must adhere to the voluntary principle, so important to the American way of life, ^{I believe} but we can attain this goal with the proper incentives.

Occasionally we find people who fear that such a program ^{as I have suggested} will create an excess of science personnel. A statement made by John R. Dunning, Dean of the School of Engineering at Columbia University is appropriate to refute this position. He stated in a recent New York Times Magazine article that "The emphasis on science and mathematics which we need so urgently for defense will be needed anyway, if we are ever to find replacements for our dwindling supplies of fuel and ore, or use our arts of automation to relieve our people of menial repetitive labor. What is military technology today is a higher and more dignified standard of living tomorrow."

In closing Mr. President, I want to say that the increased emphasis on training technical and scientific personnel is a matter of national survival and the betterment of future generations. This is a challenge which Congress alone can meet satisfactorily.